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THE U.S.D.I. OFFICE OF SURFACE MINING INITIATIVES RELATED TO COAL COMBUSTION PRODUCTS (CCPS) AND BY-PRODUCTS (CCBS)

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Abstract

Beginning in May of 1994, the Office of Surface Mining (OSM) has taken an active role in encouraging and promoting technological advances, research, and technology transfer related to the use and disposal of those material residues remaining after the combustion of coal to produce electrical power. The primary activities and accomplishments of OSM in this area have been the establishment of a multi-interest group steering committee that has:

1. conducted national interactive forums on "The Use and Disposal of CCBs at Coal Mines" in October of 1996 at Southern Illinois University and in April of 2000 at the National Energy Technology Laboratory in Morgantown, West Virginia;

2. edited, published, and distributed hundreds of copies of the forum proceedings;

3. provided technical assistance to ASTM on draft guidance for CCBs on mine sites; and

4. developed and managed an Internet Website dedicated to providing a user friendly guide to CCB and CCP literature, organizations, rule-making, and educational events.

In addition, OSM has signed a Memorandum of Understanding with the U.S. Department of Energy, National Energy Technology Laboratory (NETL) to collaborate on CCB and CCP research and issues. OSM staff also serve on the: (1) national steering committee of the Combustion By-Products Recycling Consortium in order to assist in directing CCP research efforts; and (2) the technical program committee for the biennial International Ash Symposium conducted by the University of Kentucky Center for Applied Energy Research. OSM staff are currently working with the U.S. Environmental Protection Agency to evaluate methods for improving permitting and monitoring of CCB disposal on coal mine sites.

Introduction

In May of 1994, OSM solicited recommendations for technical studies and applied research topics from the States, industry, and public interest groups. A wide variety of responses to this outreach identified CCBs as a priority topic for consideration by OSM. OSM initiated a survey in September of 1995 to determine interest in holding a national technical interactive forum on the topic of CCBs. Based on the results of this survey, OSM organized a multi-interest group steering committee, in February of 1996, to plan for and hold such a forum. One of the important interest groups that has been an active member of this committee from its inception has been the American Coal Ash Association. Because of the efforts of Dr. Barry Stewart and now Mr. Sam Tyson, the effectiveness of this steering committee has been greatly enhanced. The remainder of the paper will document the highlights of the CCB and CCP initiatives that OSM has undertaken since that time.

Coal Combustion By-Products Associated with Coal Mining Interactive Forum

In cooperation with the Mining Engineering Department at Southern Illinois University at Carbondale, OSM produced a post-forum proceedings (Chugh, 1996) that includes a series of 28 papers summarizing topics related to coal combustion by-products and their application at surface coal mines nationwide. Topics include activities related to beneficial use and disposal. The papers are presented by university researchers, State regulatory personnel, industry experts, consultants, and citizen interest groups. The papers are presented in the categories of:

1. Coal Combustion By-Product Characterization;
2. Site Characterization;
3. Regulatory Requirements;
4. Designing/Engineering/Planning;
5. Environment: Land and Water;
6. Monitoring and Evaluation; and
7. Case Studies.

An edited discussion section provides a summary of the issues raised, different perspectives, and controversies brought out during the forum. The results of subject category workgroups at the forum outline remaining issues needing further work and attention.

The following remarks summarize relevant comments concerning the disposal or use of CCB materials on the mine site made by the then Acting Director of OSM, Kathrine Henry (Henry, 1996). Back when the Surface Mining Control and Reclamation Act (SMCRA) was passed in 1977, planning for any significant utilization or disposal of coal combustion by-products at surface coal mines did not seem like much of a concern. OSM regulations provide

guidance for protecting surface and ground water quality. They also require specific plans for the disposal of coal cleaning wastes and non-coal wastes normally associated with on-site repair shop facilities. Neither SMCRA nor the OSM regulations, however, specifically address the use or disposal of the by-products of electric power generation at surface coal mines, even though a truly systematic plan for producing and use coal would logically take into consideration what to do with the final waste products, things like ash, for instance. After all, according to the *First Law of Ecology, Everything Has to Go Somewhere.*

Although a major emphasis of the administration and the electric utility industry has been to recycle coal combustion by-products into economically viable products, the recycling of coal combustion by-products has remained steady at around 25 percent over the last decade. Potential uses on the mine site include:

1. injection as a fill into old underground mines for reduction of subsidence effects;

2. use as a soil amendment to neutralize acidic spoil and thereby reduce acid mine drainage; and

3. as an ingredient in synthetic substitutes for traditional underground mine timbers.

OSM supports those efforts to recycle coal combustion by-products into commercial items for use on or off the mine site. Despite everything that's been done to create economically viable products for those residues, however, only about one-quarter of them are used in that way. The other 75 percent of the coal combustion by-products still has to be stockpiled or disposed of, *somewhere*. Interest in coal mines as potential disposal facilities or markets for new products produced from coal combustion by-products has gone up with the dramatic cost increases and mounting difficulties involved in handling those residues on site at coal fired power plants.

In 1993, the Environmental Protection Agency issued its final regulatory determination that coal combustion by-products were deemed non-hazardous and were to be regulated by the individual States under Subtitle D of the Resource Conservation and Recovery Act when disposed of as a solid waste. As a result, the States have been challenged to develop appropriate strategies for integrating the concerns of State solid waste programs with SMCRA programs when disposal occurs on permitted State Primacy coal mine sites.

When the use or disposal of coal combustion by-products happens at surface coal mines, State coal mining regulators are involved to the extent that SMCRA requires:

1. the mine operator to ensure that all toxic materials are treated, buried, and compacted, or otherwise disposed of, in a manner designed to prevent contamination of the ground or surface water;

2. making sure the proposed land use does not present any actual or probable threat of water pollution: and

3. ensuring the permit application contains a detailed description of the measures to be taken during mining and reclamation to assure the protection of the quality and quantify of surface and ground water systems, both on and off-sites, from adverse effects of the mining and reclamation process also to assure that rights of present users of such water are protected.

Any disposal of coal combustion by-products at mine sites must be in accordance with those standards and with applicable solid waste disposal requirements. The States differ in their regulatory requirements for disposal of coal combustion by-products as solid waste. Trace element concentrations in coal combustion by-products vary according to where the coal was mined. Chemical and Physical characteristics differ by region, as do mine site conditions. Accordingly, regulatory programs to allow use or disposal must be designed to handle those differences. At OSM, we are supportive of State efforts to develop appropriate methods and criteria We will do what we can to help on request.

Currently, the debate over use or disposal of coal combustion by-products at coal mines centers on the potential for the materials to release toxins back into the environment. We recognize that improved knowledge, of the risks and benefits associated with disposal and use of coal combustion by-products, is badly needed as is a greater acceptance of that knowledge by regulators and the public. The more we know, the more options we have.

At the conclusion of the forum, the CCB Steering Committee met and identified the following five items as the most important needs identified by the 1996 forum:

1. a guidance document for the use and disposal of CCB materials within the coal mining environment;

2. acceptable monitoring procedures for evaluating the interaction of ground water at CCB disposal sites;

3. development of formal education and training opportunities on various aspects of CCB handling;

4. additional forums, workshops, or symposia to address various aspects of CCB handling that have not yet been sufficiently addressed; and

5. develop better methods for communicating aspects of CCB handling to the public.

The CCB Steering Committee made the following recommendations to its sponsoring organization management:

1. the highest priority and energies of the sponsoring organizations should be to pursue the development of a "State of the Science Resource Manual" on the evaluation and handling of CCB materials on the mine site for use or disposal;

2. there should be a follow up forum to address concerns raised by the work groups on aspects of CCB evaluation and handling that were not sufficiently addressed by the forum; and

3. assuming that recommendations 1 and 2 can be accomplished, efforts should be directed by OSM, in its role of technology transfer, to provide as a part of its National Technical Training Program, opportunities for mining personnel to learn basic methods for the handling and evaluation of CCB materials.

Coal Combustion By-Products Information Network Website

In March of 1997, the USDI Office of Surface Mining (OSM) invited resource agencies and organizations, that are working with or have access to significant information on CCBs, to participate as a voluntary Steering Committee that would develop a system for making this information accessible to potential users in the coal mining community. The Steering Committee developed a Website that can be accessed directly at http://www.mcrcc.osmre.gov/ccb/ or through the OSM Home Page at www.osmre.gov that contains:

1. a user friendly guide, including abstracts, of existing scientific and technical literature;
2. sources and location of CCB literature;
3. access to the OSM library for copies of significant literature for loan to potential users;
4. definitions of basic terminology;
5. name and phone numbers of State CCB contacts;
6. information and access to upcoming CCB special events;
7. a chronology of relevant dates and events related to rule-making by the U.S. EPA; and
8. identification of related Websites that contain information on active researchers and research programs.

The Use and Disposal of Coal Combustion By-Products at Coal Mines: A Technical Interactive Forum

Many of the questions and concerns raised at the 1996 Interactive Forum, however, have not yet been addressed. In response to these additional concerns, the CCB Steering Committee resolved to conduct an additional technical interactive forum in the year 2000 to address the more important concerns and new developments related to coal mining and CCBs that were either identified at the 1996 forum or since that time.

The purpose of this technical interactive forum on April 12 and 13, 2000, at the facilities of the U.S. DOE National Energy Technology Laboratory in Morgantown, West Virginia, was to provide:

1. an organized format for discussion of issues concerning the use and disposal of CCBs at coal mines;
2. an easily understood, state of the art summary talk by knowledgeable speakers;
3. a published proceedings that summarizes the presentations and participant discussions;
4. access to the discussions for all interested participants at the forum;

5. opportunity for poster presentations on CCB projects and research;

6. opportunity for exhibits of CCB use, technology, services, and equipment; and

7. optional technical CCB Workshops and Field Trips on April 14, 2000.

The talks covered four topic categories. The first topic category of **CCB Basics**, covered the subtopics of:

1. characterization;

2. classification;

3. origin; and

4. destinations.

The second topic category of **Regulatory** included the subtopics of:

1. status;

2. trends; and

3. legal liabilities.

The third topic category of **Beneficial Uses at the Mine Site** included subtopics of:

1. treatment of acid forming material;

2. emerging technologies; and

3. subsidence control and Acid Mine Drainage reduction for underground mines.

The fourth topic category of **Hydrology** included the subtopics of:

1. long term monitoring and

2. leachate quality.

At the conclusion of the forum, the participants recommended that the steering committee focus on the following initiatives for future actions:

1. provide assistance to the U.S. EPA on documentation of mine related damage cases;

2. provide assistance to ASTM on development of improved standard testing methods for CCBs on mine sites;

3. conduct region specific technical forums; and

4. enhance educational and Internet outreach on CCB issues and information.

Memorandum of Understanding (MOU) Between Office of Surface Mining and National Energy Technology Laboratory (NETL)

On February 10, 1999, OSM signed an MOU with NETL to collaborate on coal mining related and environmental issues. They agreed to cooperate in three principal areas:

1. Technical Services and Equipment Utilization;

2. Technical Expertise; and

3. Information Exchange.

Areas of mutual interest potentially related to CCBs included:

1. Mine drainage prevention, elimination, and treatment;

2. remining/reprocessing coal waste;

3. coal combustion by-product disposal; and

4. preservation of the hydrologic balance.

OSM staff participate with NETL on the newly formed Steering Committee for the Emission Control By-Products Consortium that is attempting to develop technologies for use by the coal utilities and their suppliers that will be useful in solving problems related to the handling of by-products from their clean coal processes. The main strategy of the consortium is to:

1. characterize product streams from flue gas desulfurization materials and low nitrous oxide burners;

2. develop a list of potential market opportunities and disposal options; and

3. develop and implement research and demonstration programs around identified priority topics.

International Ash Utilization Symposium, Center for Applied Energy Research, University of Kentucky

OSM staff provided assistance to the technical program committee planning for the above event to take place October 18-20, 1999, in Lexington, Kentucky. The biennial event covered all aspects of coal combustion by-product utilization. The program included recent research findings in over a dozen topical areas. The OSM staff encouraged the presentation of papers by experts in the areas of mine disposal, underground injection, and treatment of acid forming materials. OSM staff is currently providing assistance to the technical program committee planning for the same event in 2001.

ASTM Standard Guide for The Use of Coal Combustion Products (CCPs) for Surface Mine Reclamation

Since June of 2000, the steering committee has been actively participating with the American Society for Testing Materials (ASTM) in the development of a standard guide for technical methods to be used in evaluating CCBs for use or disposal at mine sites. Committee members are actively reviewing and commenting on draft guidance documents being prepared by ASTM.

U.S. Environmental Protection Agency (EPA) Rule-making on CCBs Related to their Use and Disposal on Mine Sites

EPA published its Notice of Availability on April 28, 1999, for the EPAs Report to Congress on Fossil Fuel Combustion Wastes not previously studied including oil, natural gas, and certain coal combustion wastes. EPA purposed to determine whether the remaining fossil fuel combustion wastes should retain their exemption from hazardous waste regulations referred to as the Bevill Exemption. Of potential concern to the mining community, EPA stated that "The Agency currently has insufficient information on managing fossil fuel combustion wastes in surface and underground mines in order to assess the potential for risks associated with this practice, whether for disposal or beneficial uses such as mine reclamation." During the comment period, OSM provided extensive input on the requirements of the Surface Mining Control and Reclamation Act as well as pertinent research results related to the use of CCBs at mine sites. OSM benefitted significantly from timely inputs of detailed information from the American Coal Ash Association and other interest groups. OSM provided letters from its Director as well as from the Assistant Secretary of the Interior in support of the position that listing of CCBs at mine sites under Subtitle C (Hazardous Waste) under RCRA was not warranted.

In its decision on May 22, 2000, the U.S. EPA determined that national regulations under subtitle D (Solid Waste) of the Resource Conservation and Recovery Act (RCRA) [and/or possible modifications to regulations under the Surface Mining Control and Reclamation Act (SMCRA)] were warranted when these wastes are used to fill surface or underground mines. EPA believes this is necessary so that CCBs will be consistently managed across all waste scenarios.

On September 14, 2000, EPA met with OSM to initiate a dialog between the two agencies concerning EPA rulemaking for CCBs used as fill at surface and underground mine sites. During the course of this discussion, EPA informed OSM that EPA expects to have a proposed rule out under Subtitle D of RCRA (Solid Waste) in 2003 and a final rule by 2004.

EPA has also invited OSM staff on a series of joint tours of mines sites where CCBs are being used as fill. To date, tours have taken place in the anthracite mining districts in Pennsylvania and in Northern West Virginia where Fluidized Bed Combustion Ash is being returned to the mine site to support reclamation and as a seal for acid forming materials. A tour is currently being planned for Indiana after the new year.

The concern that EPA has expressed to OSM as to why they feel EPA regulation is necessary is:

- EPA has found a small number of unlined solid waste disposal facilities at electric utilities where leachates from the facility have been determined to contain elements at levels of

toxicity determined to be detrimental to public health and/or the environment. Although they have not found any such examples at mine sites, they feel that the similarities between these utility disposal sites and mine sites where CCBs are placed as fill warrant similar regulation.

Concerns OSM has expressed to EPA as to why EPA rulemaking for mine sites may not be warranted include:

- OSM believes that the SMCRA regulations already provide at least as much protection of the public health and environment as anything as yet proposed by EPA. The extensive mining and reclamation designs, environmental investigations, leachate testing, requirements to protect or replace drinking water sources, performance bonding, and post reclamation monitoring requirements of SMCRA make mine sites significantly more protective of the environment that what is found utility ash disposal sites and therefore are not similar to them.
- EPA has yet to bring forward any data or evidence that CCBs used as fill at mine sites under SMCRA have resulted in any toxicity that poses a threat to public health or the environment.
- There has been extensive research over the last 15 years related to effects of CCBs used as mine fill, subsidence control, as seals for acid forming materials, for the reduction of acid mine drainage, and reclamation of abandoned mine lands. To date, all of this research has indicated that the use of CCBs at mine sites is beneficial to public health and the environment in most cases and at a minimum has no negative effect on public health or the environment.

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